

1 1. (Previously Presented and Once Amended) A method for
2 communicating a data stream, the method comprising the steps of,
3 generating a sequence of data symbols from the data stream,
4 precoding the sequence of data symbols into a sequence of
5 precoded data symbols,
6 modulating the sequence of precoded data symbols into a
7 continuous phase modulated signal,
8 transmitting the continuous phase modulated signal,
9 receiving the continuous phase modulated signal, and
10 filtering the continuous phase modulated signal into a
11 sequence of filtered signals having absolute phase for indicating
12 the sequence of data symbols.

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16 2. (Previously Presented and Once Amended) The method of claim 1
17 further comprising the steps of,
18 sampling the sequence of filtered signals into a sequence of
19 sampled symbols, and
20 demodulating the sequence of sampled symbols into an estimated
21 data stream.

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1 3. (Previously Presented and Once Amended) The method of claim 1
2 wherein,

3 the generating step comprises the steps of receiving the data
4 stream of data bits, formatting the data stream into the sequence
5 of formatted data pulses as a sequence of data symbols within an M-
6 ary symbol set,

7 the modulating step comprises the steps of Gaussian filtering
8 and frequency modulating for generating the continuous phase
9 modulated signal, the Gaussian filter step filters the precoded
10 sequence of data symbols into pulse responses continuously
11 accumulated over a finite memory time as a filter response, the
12 Gaussian filtering step is defined by a bandwidth time product
13 inversely defining the finite memory time, the frequency modulating
14 step frequency modulates a carrier reference by the filter response
15 by a modulation index for converting the filter response into the
16 continuous phase modulated signal,

17 the continuous phase modulated signal is up converted from
18 baseband during the transmitting step and is down converted to
19 baseband during the receiving step using a local carrier, and

20 the filtering step is a matched filtering step for matched
21 filtering of the received continuous phase modulated signal into
22 the filtered signal, the matched filtering is matched by pulse
23 amplitude modulation representation to the Gaussian filtering step,
24 the filtered signal has an absolute phase at a periodic sampling
25 time for indicating the sequence of data symbols.

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1 4. (Previously Presented and Twice Amended) The method of claim 3
2 wherein,

3 the modulation index is equal to a fraction selected from a
4 group consisting of $1/M$ and $(1-1/M)$ fractions for the M-ary symbol
5 set where $M=2^k$ and k is an integer.

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7 5. (Previously Presented and Twice Amended) A method for
8 communicating a data stream, the method comprising the steps of,
9 generating a sequence of data symbols from the data stream by
10 formatting the data stream into the sequence of formatted data
11 pulses as a sequence of data symbols within a 2-ary symbol set,
12 precoding the sequence of data symbols into a sequence of
13 precoded data symbols,

14 Gaussian filtering the precoded sequence of data symbols into
15 pulse responses continuously accumulated over a finite memory time
16 as a filter response, the Gaussian filtering is defined by a
17 bandwidth time product inversely defining the finite memory time,
18 frequency modulating a carrier reference by the filter
19 response by a modulation index for converting the filter response
20 into a continuous phase modulated signal, and

21 matched filtering the received continuous phase modulation
22 signal into a filtered signal, the matched filtering is matched by
23 pulse amplitude modulation representation to the Gaussian
24 filtering, the filtered signal has an absolute phase at a periodic
25 sampling time for indicating the sequence of data symbols.

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1 6. (Previously Presented and Amended) The method of claim 5,
2 wherein,

3 the sequence of data symbols has a data symbol d_n at a current
4 symbol time n where n is an integer and has a data symbol d_{n-1} at an
5 immediate previous symbol time $n-1$ for precoding the data sequence
6 into the sequence precoded data symbols having a precoded data
7 symbol α_n at the current symbol time, the precoding step is defined
8 by $\alpha_n = [d_n - d_{n-1} + 1]_{\text{mod}4}$.

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10 7. (Previously Presented and Once Amended) The method of claim 5,
11 wherein,

12 the sequence of data symbols has a data symbol d_n at a current
13 symbol time n where n is an integer and has a data symbol d_{n-1} at an
14 immediate previous symbol time $n-1$ for precoding the data sequence
15 into the sequence of precoded data symbols having a precoded data
16 symbol α_n at the current symbol time for even symbol times and for
17 odd symbol times, the precoding step is defined by $\alpha_n = [d_n - d_{n-1}$
18 $+ 1]_{\text{mod}4}$ for even symbol times and $\alpha_n = -[d_n - d_{n-1} + 1]_{\text{mod}4}$ for
19 odd symbol times.

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22 8. (Previously Presented and Original) The method of claim 5
23 wherein the modulation index is $1/2$.

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27 9. (Previously Presented and Original) The method of claim 5
28 wherein the bandwidth time product is $1/3$.

1 10. (Previously Presented and Original) The method of claim 5
2 wherein the filtering step is a matched filtering step for applying
3 a principal Laurent function to the baseband signal so that the
4 filtered signal comprises a principal Laurent component.

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7 11. (Previously Presented and Twice Amended) A method for
8 communicating a data stream, the method comprising the steps of,
9 generating a sequence of data symbols from the data stream by
10 formatting the data stream into the sequence of formatted data
11 pulses as a sequence of data symbols within a 4-ary symbol set,
12 precoding the sequence of data symbols into a sequence of
13 precoded data symbols,

14 Gaussian filtering the precoded sequence of data symbols into
15 pulse responses continuously accumulated over a finite memory time
16 as a filter response, the Gaussian filtering is defined by a
17 bandwidth time product inversely defining the finite memory time,
18 frequency modulating a carrier reference by the filter
19 response by a modulation index for converting the filter response
20 into a continuous phase modulated signal,

21 matched filtering the continuous phase modulated signal into a
22 filtered signal, the matched filtering is matched by pulse
23 amplitude modulation representation to the Gaussian filtering, the
24 filtered signal has an absolute phase at a periodic sampling time
25 for indicating the sequence of data symbols, and

26 demodulating the sequence of data symbols into an estimate of
27 the data stream.

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1 12. (Previously Presented and Original) The method of claim 11,
2 wherein,

3 the sequence of data symbols has a data symbol d_n at a current
4 symbol time n and has a data symbol d_{n-1} at an immediate previous
5 symbol time $n-1$ for precoding the data sequence into the sequence
6 precoded data symbols having a precoded data symbol α_n at the
7 current symbol time, the precoding step is defined by $\alpha_n = [d_n -$
8 $d_{n-1} + 1]_{\text{mod}8}$.

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11 13. (Previously Presented and Original) The method of claim 12
12 wherein the precoded data symbol α_n is defined by the 4-ary symbol
13 set of +1, -1, +3 and -3.

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16 14. (Previously Presented and Original) The method of claim 12
17 wherein the modulation index is 1/4.

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20 15. (Previously Presented and Original) The method of claim 11,
21 wherein,

22 the sequence of data symbols has a data symbol d_n at a current
23 symbol time n and has a data symbol d_{n-1} at an immediate previous
24 symbol time $n-1$ for precoding the data sequence into the sequence
25 precoded data symbols having a precoded data symbol α_n at the
26 current symbol time, the precoding step is defined by $\alpha_n = [d_n -$
27 $d_{n-1} + 3]_{\text{mod}8}$.

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1 16. (Previously Presented and Original) The method of claim 15
2 wherein the precoded data symbol α_n is defined by the 4-ary symbol
3 set of +1, -1, +3 and -3.

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5 17. (Previously Presented and Original) The method of claim 15
6 wherein the modulation index is $1/4$.

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8 18. (Previously Presented and Amended) The method of claim 11
9 wherein the filtering step is a matched filtering step for applying
10 a principal Laurent function, a third Laurent function and a
11 twelfth Laurent function to the baseband signal so that the
12 filtered signal comprises a principal Laurent component, a third
13 Laurent component and a twelfth Laurent component.

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15 19. (Previously presented and original) The method of claim 11
16 wherein the modulation index is $3/4$.

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18 20. (Previously presented and original) The method of claim 11
19 wherein the bandwidth time product is $1/3$.

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